**Dark energy**

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In physical cosmology, dark energy is a hypothetical form of energy that permeates all of space and tends to increase the rate of expansion of the universe.

Assuming the existence of dark energy is the most popular way to explain recent observations that the universe appears to be expanding at an accelerating rate.

In the standard model of cosmology, dark energy currently accounts for almost three-quarters of the total mass-energy of the universe. Two proposed forms for dark energy are the cosmological constant, a constant energy density filling space homogeneously, and scalar fields such as quintessence or moduli, dynamic fields whose energy density can vary in time and space.

In fact contributions from scalar fields which are constant in space are usually also included in the cosmological constant.

The cosmological constant is thought to arise from the vacuum energy.

Scalar fields which do change in space are hard to distinguish from a cosmological constant, because the change may be extremely slow. High-precision measurements of the expansion of the universe are required to understand how the speed of the expansion changes over time.

The rate of expansion is parameterized by the cosmological equation of state.

Measuring the equation of state of dark energy is one of the biggest efforts in observational cosmology today. Adding the cosmological constant to cosmology's standard FLRW metric leads to the Lambda-CDM model, which has been referred to as the "standard model" of cosmology because of its precise agreement with observations. The exact nature of this dark energy is a matter of speculation.

It is known to be very homogeneous, not very dense and is not known to interact through any of the fundamental forces other than gravity.

Since it is not very dense -- roughly 10−29 grams per cubic centimeter -- it is hard to imagine experiments to detect it in the laboratory.

Dark energy can only have such a profound impact on the universe, making up 70% of all energy, because it uniformly fills otherwise empty space.

The two leading models are quintessence and the cosmological constant. The simplest explanation for dark energy is that it is simply the "cost of having space": that is, a volume of space has some intrinsic, fundamental energy.

Another possibility is that dark energy may become dark matter when buffeted by baryonic particles, thus leading to particle-like excitations in some type of dynamical field, referred to as quintessence.

Quintessence differs from the cosmological constant in that it can vary in space and time.

In order for it not to clump and form structure like matter, it must be very light so that it has a large Compton wavelength.

**Dark energy**

Dark energy is a hypothetical form of energy that is in all of space and increases the rate of expansion of the universe. Dark energy is a way to explain observations that the universe appears to be expanding at an accelerating rate. Dark energy accounts for 2/3ds of the total mass of the universe. Measuring the equation of state of dark energy is one of the biggest efforts in observational cosmology today. The exact nature of this dark energy is a matter of speculation. Dark energy can only have such a profound impact on the universe, making up 70% of all energy, because it fills empty space. Dark energy may become dark matter when buffeted by particles. This all is very important to know because so much of our entire universe is dark energy and dark matter. We aren’t even able to know exactly what it is and how it affects us. It is known that it doesn’t only affect gravity but other unknown forces that have yet to be discovered. There is a lot more to be learned.